CLAIMS

1   1.   A switch element comprising:

2   a plurality of input interfaces to receive data;

3   a plurality of output interfaces to transmit said data; and

4   a buffer to couple to said plurality of input interfaces and to said plurality of

5   output interfaces, the buffer including a multi-dimensional array of output queues to

6   store said data, wherein said multi-dimensional array of output queues is shared by said

7   plurality of output interfaces.

1   2.   The switch element of claim 1, wherein said multi-dimensional array of

2   output queues comprise a three-dimensional array of output queues.

1   3.   The switch element of claim 2, wherein said three-dimensions comprise:

2   a)   a first dimension relating to a number of outputs on said switch

3   element;

4   b)   a second dimension relating to a number of logical paths for said data;

5   and

6   c)   a third dimension relating to a number of outputs from a next switch

7   element.

1   4.   The switch element of claim 3, wherein said logical paths are assigned

2   priority levels.

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1   5.   The switch element of claim 1, wherein said multi-dimensional array of

2   output queues share space of said buffer.

1   6.   The switch element of claim 1, further comprising a plurality of virtual

2   input queues, wherein each virtual input queue represents a portion of said buffer.

1   7.   The switch element of claim 1, further comprising an arbiter to select

2   data for transmission of said data to a downstream element.

1   8.   The switch element of claim 7, wherein said arbiter selects said data

2   based on status information at said switch element.

1   9.   The switch element of claim 8, wherein a queue status monitor

2   transmits a feedback signal from said switch element to a plurality of upstream switch

3   elements, said feedback signal comprising status information of output queues of said

4   switch element.

1   10.   The switch element of claim 8, wherein said arbiter selects said data by

2   utilizing transmit pressure information.

1   11.   A switch fabric network for transmitting data, said network comprising:

2   a first switch element; and

3   a second switch element coupled to said first switch element, said second

4   switch element comprising:

5   a plurality of input interfaces to receive data from at least said first

6   switch element;

7   a plurality of output interfaces to transmit said data; and

8   a buffer to couple to said plurality of input interfaces and to said

9   plurality of output interfaces, the buffer including a multi-dimensional array of output

10   queues to store said data, wherein said multi-dimensional array of output queues is

11   shared by said plurality of output interfaces.

1   12.   The switch fabric network of claim 11, wherein said multi-dimensional

2   array of output queues comprise a three-dimensional array of output queues.

1   13.   The switch fabric network of claim 11, said second switch element

2   further comprising a plurality of virtual input queues, wherein each virtual input queue

3   represents a portion of said buffer.

1   14.   The switch fabric network of claim 11, said second switch element

2   further comprising an arbiter to select data for transmission of said data to a

3   downstream switch element.

1   15.   The switch fabric network of claim 14, wherein said arbiter selects said

2   data by utilizing transmit pressure information.

1   16.   A method of using a switch element in a switch fabric network, said

2   method comprising:

3   receiving data at an input interface of said switch element;

4   routing said data to one of a multi-dimensional array of output queues provided

5   within a buffer of said switch element; and

6   outputting said data from a selected one of said output queues.

1   17.   The method of claim 16, wherein said multi-dimensional array of output

2   queues comprise a three-dimensional arrays of output queues.

1   18.   The method of claim 17, wherein said three-dimensions comprise:

2   a)   a dimension relating to a number of outputs on said switch element;

3   b)   a dimension relating to a number of logical paths for said data; and

4   c)   a dimension relating to a number of outputs from a next switch element.

1   19.   The method of claim 16, wherein said switch element comprises a

2   plurality of virtual input queues, wherein each virtual input queue represents a portion

3   of said buffer.

1   20.   The method of claim 16, further comprising selecting said data in one of

2   said output queues prior to said outputting.

1   21.   The method of claim 20, wherein said data is selected based on status

2   information at said switch element.

1   22.   The method of claim 20, wherein said data is selected by utilizing

2   transmit pressure information.

1   23.   The method of claim 16, further comprising transmitting a feedback

2   signal from said switch element to a plurality of upstream switch elements, said

3   feedback signal comprising status information of output queues of said switch element.

1   24.   A switch element comprising:

2   a buffer including a multi-dimensional array of output queues to store data; and

3   an arbiter to select one of said output queues for transmission of data, and a

4   queue status monitor to track the statuses of said multi-dimensional array of said

5   output queues.

1   ~~25.~~ The switch element of claim 24, wherein said arbiter selects said one of

2   said output queues based on information of said switch element and information of a

3   next switch element.

1   26.   The switch element of claim 25, wherein said arbiter further selects said

2   one of said output queues based on transmit pressure information.

1   27.   The switch element of claim 24, wherein said multi-dimensional array of

2   output queues comprises three-dimensional output queues.

1   ~~28.~~ The switch element of claim 27, wherein said three-dimensions

2   comprise:

3   a)   a first dimension relating to a number of outputs on said switch

4   element;

5   b)   a second dimension relating to a number of logical paths; and

6   c)   a third dimension relating to a number of outputs from a next switch

7   element.

1   29.   The switch element of claim 24, further comprising a plurality of virtual

2   input queues, wherein each virtual input queue represents a portion of said buffer.

1   30.   The switch element of claim 24, wherein said arbiter selects said one of

2   said output queues based on status information at said switch element.

1   31.   The switch element of claim 24, wherein said queue status monitor

2   transmits a feedback signal from said switch element to a plurality of upstream switch

3   elements, said feedback signal comprising status information of output queues of said

4   switch element.

1   32.   A method of communicating information in a switch element, said

2   method comprising:

3   receiving data at said switch element;

4   storing said data in one queue of a multi-dimensional array of output queues in

5   a buffer of said switch element; and

6   selecting one of said output queues for transmission of data.

1   33.   The method of claim 32, wherein selecting said one of said output

2   queues comprises selecting based on information of said switch element and

3   information of a next switch element.

1   34.   The method of claim 33, wherein said selecting is further based on

2   transmit pressure information.

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1   35.   The method of claim 32, wherein said multi-dimensional array of output

2   queues comprises a three-dimensional array of output queues.

1   36.   The method of claim 35, wherein said three-dimensions comprise:

2   a)   a first dimension relating to a number of outputs on said switch

3   element;

4   b)   a second dimension relating to a number of logical paths for said data;

5   and

6   c)   a third dimension relating to a number of outputs from a next switch

7   element.

1   37.   The method of claim 32, wherein said switch element includes a

2   plurality of virtual input queues, wherein each virtual input queue represents a portion

3   of said buffer.

1   38.   The method of claim 32, further comprising transmitting a feedback

2   signal from said switch element to a plurality of upstream switch elements, said

3   feedback signal comprising status information of output queues of said switch element.

1   39.   A switch comprising:

2   a first output interface associated with a first output link;

3   a first queue associated with said first output interface; and

4 a first arbiter associated with said first output interface and said first queue,

5 wherein said first arbiter schedules a next data packet for transmission from said first

6 output interface based on one of a pressure function and a local path priority.

1 40. The switch of claim 39, wherein said first arbiter schedules said next data

2 packet for transmission from said first output interface based on both said pressure

3 function and said local path priority.

1 Sub 41) The switch of claim 40, wherein said first arbiter schedules said next data

2 packet based on calculated transmit priorities of target queues in a downstream switch.

1 42. The switch of claim 41, wherein said first arbiter schedules said next data

2 packet relating to a target queue having a highest calculated transmit priority.

1 43. The switch of claim 39, further comprising a second output interface

2 associated with a second output link, a second output queue associated with said

3 second output interface, and a second arbiter to schedule a next data packet for

4 transmission from said second output interface.

1 Sub 44) The switch of claim 39, wherein said pressure function relates to a

2 relationship of data in said switch and data in a downstream switch.

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1   45. A method of scheduling data traffic from a switch, said method

2 comprising:

3   determining a transmit priority based on one of a pressure function and a local

4 path priority; and

5   scheduling data traffic based on said determined transmit priority.

1   46. The method of claim 45, wherein said determining is based on both said

2 pressure function and said local path priority.

1   47. The method of claim 45, wherein transmit priority is further determined

2 based on information of target queues in a downstream switch.

1   48. The method of claim 47, wherein said scheduling comprises selecting a

2 target queue of said downstream switch having a highest calculated transmit priority.

1   49. The method of claim 45, wherein said pressure function relates to a

2 relationship of data in said switch and data in a downstream switch.